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The Economy-Wide Impact of Multilateral NAMA  
Tariff Reductions:  
A Global and Danish Perspective

Institute of Food and Resource Economics (FOI)

Working Paper 2007/4

# **The Economy-Wide Impact of Multilateral NAMA Tariff Reductions: A Global and Danish Perspective<sup>1</sup>**

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## ***Abstract***

*The Non-Agricultural Market Access (NAMA) negotiations were a key area in the Doha development round, which was suspended indefinitely in July 2006. In this paper, we model and estimate the economic effects on the world and Danish economies of some of the more important proposals that will likely re-emerge in some form in the near future. We used the GTAP computable general-equilibrium model and database to simulate trade shock scenarios that mimic WTO's "August 2004 NAMA Framework", which proposed a series of tariff reductions based on using the Swiss formula and flexibility rules for specific groups of countries. We illuminate the economic impacts of the proposed NAMA tariff reductions, with and without the developing country flexibility rule.*

*Our results suggest modest NAMA-induced effects: relatively small average tariff reductions that in turn increase global trade by about 1 percent and global welfare by just over 9 billion US\$. Trade would expand for most observed sectors, but vary across the sectors, with particularly high gains realised for the textile and clothing sectors. A number of Asian countries would particularly benefit from the NAMA tariff reductions.*

*The NAMA tariff reductions with flexibility would generate modest increases in Danish trade and produce a slight improvement in the trade balance. They would also shift Danish trade patterns from EU and EFTA markets towards other world markets. The removal of the developing country flexibility rule would increase global welfare by 26 percent, with the largest gains occurring in the Asian countries. The removal of the flexibility rule has virtually no impact on Danish welfare.*

## ***Keywords:***

*Doha WTO, NAMA, market access, applied general equilibrium modelling, Denmark*

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## Introduction

The Non-Agricultural Market Access (NAMA) negotiations have been considered a key area in the Doha development round. The round was launched in 2001, and progressed slowly and fitfully until July 2006, when the round was suspended for the time being. This does not diminish the importance of analysing economic impacts of the major pre-collapse proposals, insofar as these proposals will likely re-emerge in some form in the near future. As a result, we proceed here to model the economic effects on the world and Danish economies of some of the more important proposals that emerged before the suspension. More specifically, we take the well-known GTAP (Global Trade Analysis Project) computable general equilibrium model, and incorporate a pair of simulated trade shocks that mimic a possible outcome of the Doha development round following the guidelines found in WTO's (World Trade Organization) "August 2004 NAMA Framework" (WTO 2004) and the outcome of the negotiating group on market access – Towards NAMA Modalities (WTO 2006a).

In the proposal (framework), WTO member countries are classified into six groups, each with different commitments to reduce bound tariffs based on the uses of the Swiss formula. Least developed countries are exempt from making any reduction commitments, while developing countries have the possibility to use the so called "flexibility rules" to exempt a number of tariff lines from reduction commitments. The developed countries have to reduce all their bound tariffs with no possibility of exemption.

In this paper we focus on illuminating the economic impacts of a possible WTO NAMA tariff reductions scenario, with and without the developing country flexibility rule. We note that this study focuses only on the economic impacts of the NAMA tariff reductions, and does not include liberalisation of agricultural and services sector barriers implied/proposed by WTO round efforts. Secondly, the model used in this analysis is a comparative static model and does not include dynamic gains from increased trade in the analysis.

We find that on average the NAMA reform produces relatively small reductions in tariffs. Least developed countries are exempt from making any reductions, and we find that many developing countries (the so-called paragraph 6 and small vulnerable economies) can implement their NAMA commitments in such a way that reductions in applied tariffs are altogether avoided. As for all other countries, with the notable

exception of India, non-agricultural tariffs are on average already fairly low (single digits).

The reduction of NAMA tariffs is found to modestly increase global trade by about 1 percent and global welfare by just over 9 billion US\$ when the developing countries use the flexibility rule to exempt up to 5 percent of their tariff lines. And while trade expands for most observed sectors, there is variation in such increases across sectors, with particularly high gains realised for the textile and wearing apparel sectors. A number of Asian countries particularly benefit from the NAMA reductions. The abolishment of the flexibility is found to increase global welfare by 26 percent to nearly 12 billion US\$ with Asian countries clearly gaining most from increasing market access.

The NAMA tariff reductions with flexibility are expected to generate modest increases in Danish trade: 53 million US\$ in exports; 34 million US\$ in imports; producing a slight improvement in the trade balance of 19 million US\$. The reductions are expected to increase Danish welfare by 30 million US\$. Of interest is that the NAMA reductions are expected to shift Danish trade patterns from EU and EFTA markets towards other world markets. Readers should note, however, that despite the net gains to Denmark from the NAMA reductions, some winner and loser industries are expected to emerge. Danish transport services are likely to benefit while Danish exports of motor vehicles and parts may show slight reductions. The removal of the developing country flexibility rule has virtually no impact on Danish welfare.

Four sections follow this introduction. The first is a discussion of the model, and the data and databases employed. In the second section, we fully discuss the employed database of applied and bound tariffs. Third we define the two simulated NAMA scenarios, including: precise definitions of the two scenarios; a discussion of the Swiss formula concept; definition of the relevant country groups; a short summary of technical aspects of scenario implementation; and a summary on alternative methods of calculating reductions in bound tariffs and on rules of developing country flexibility. Fourth, we provide two sets of simulation results: the economic impacts of the two simulations on the world economy and on the Danish economy which is followed by a conclusion.

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## Model and Data

The analysis undertaken in this paper is based upon the GTAP model (Hertel, 1997) and database (Dimaranan et al, 2005). The database is the most recent Version 6 with the base year 2001. The 2001 tariff data is from the Market Access Maps (MAcMap) contributed by the Centre d'Etudes Prospectives et d'Information Internationales (CEPII) and the standard GTAP model used is version 6.2 (Bouet, et. al. 2005).

### *Model Description*

The GTAP model is a standard multi-regional, static computable general equilibrium (CGE) model. Like any other applied economic model, it is based on assumptions concerning both the theoretical structure as well as the specific parameters and data used. The model's regional production is generated by a constant return to scale technology in a perfectly competitive environment, and private demand is characterised by a non-homothetic<sup>3</sup> demand system (a Constant Difference Elasticity function).<sup>4</sup> The foreign trade structure reflects the Armington assumption implying imperfect substitutability between domestic and foreign goods.

The model uses a neoclassical macroeconomic closure, where investments are endogenous and adjust to accommodate any changes in savings. This approach is adopted at the global level and investments are then allocated across regions to equalise the marginal rate of return in all regions. While global investments and savings equalise, this does not hold at the regional level, where the trade balance is endogenously determined as the difference between regional savings and regional investments. This is valid as the regional savings enter the regional utility function (representing the value of future consumption). The quantity of endowments (land, labour and capital) in each region is fixed exogenously in the model. In the case of the labour market, this means that the simulated policy changes occur at full employment where the wage rates and sectoral employment may vary but not the total number of people employed. Finally, the numeraire used in the model is a price index of the global endowment index.

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<sup>3</sup> Non-homothetic means that the relative composition of demand is allowed to change with changes in income. For instance, consumers may use a smaller share of their income on food as they grow richer.

<sup>4</sup> Hence, the present analysis abstracts from features such as imperfect competition and increasing returns to scale, which may, however, be important in certain sectors.

### *Database*

The global database used in this study is version 6 of the GTAP database with the base year 2001. The database combines detailed bilateral trade, transport and protection data characterising economic linkages among regions, together with individual country input-output databases which account for intersectoral linkages within regions. The database contains 87 regions and 57 sectors which are aggregated to 45 regions and 19 sectors in order to keep the model within computational limits and focused on NAMA sectors.

The applied ad valorem equivalents (AVEs) tariff data found in the standard GTAP version 6 database originates from the Market Access Maps (MacMap) database, which is compiled from UNCTAD TRAINS data, country notifications to the WTO, AMAD, and from national customs information.

The MacMap database contains bound, MFN and bilateral applied tariff rates (both specific and ad valorem) at the 6-digit Harmonised Systems (HS6) level.<sup>5</sup> The MacMap tariff data is aggregated to GTAP concordance using trade weights compiled from the COMTRADE database.

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<sup>5</sup> The HS6 nomenclature is an international standard for classifying products into aggregated product groups. The classification scheme contains about 5000 product groups, is maintained by the World Customs Organization (WCO) and is used for specifying tariff schedules.



## The MAcMap database: Binding overhang

### *Tariffs: Bound, Most Favoured Nations (MFN) and Applied rates*

Before proceeding, we clarify some of the technical definitions related to NAMA tariff reductions. In trade policy analysis we operate with three types of tariffs: bound, Most Favoured Nations (MFN) and applied tariff rates. Applied rates are the tariffs attached to every single trade flow between two countries, whether or not one or both countries are WTO members. Applied rates affect trade flows directly, and in terms of trade policy modelling we implement scenarios by changing (“shocking”) the value of applied tariffs.

In contrast, bound and MFN rates are instruments used by the WTO to establish rules governing the design of applied tariff schedules of member countries. Thus, they are only relevant for trade flows between WTO members. The MFN tariff schedule specifies a single tariff per tariff line (i.e. product group). According to WTO’s Most Favoured Nations principle, applied rates may be lower but never higher than the MFN rate. Typically, applied rates on imports from certain countries are lower than the MFN rate due to bilateral free trade agreements, customs unions, or preferential concessions. For instance, if Denmark’s MFN rate for a tariff line (say “canned pears”) is 10 percent, applied rates faced by different exporters into Denmark may never be higher than 10 percent. However, Denmark can specify an applied tariff of 0 percent for trade flows originating from other EU members. As a result, the average applied rate is always equal to or less than the MFN rate.

Bound rates are used in WTO negotiations to reflect commitments of partners to an agreement. A tariff line is said to be bound at a specified level, implying that the corresponding MFN rate (and hence applied rates) may never be higher than this level. Moreover, binding a tariff line means that this tariff rate ceiling can never be raised, even in subsequent negotiation rounds. However, not all tariff lines are bound, and some countries, particularly developing countries, still have a large part of their tariff lines unbound. One of the outcomes of a Doha round will be to bind all (or most) tariff lines for all but the least developed countries (the NAMA binding commitments are discussed below).

### *Changes in applied rates*

The economic consequences of the NAMA trade reform depend on how much the reductions in the bound rate actually affect the applied rates. Only when applied rates

hit the ceiling created by the negotiated bound rates will the reform have any effect. Often countries specify applied rates which are lower than the bound rates because of free trade agreements, preferential rates, or simply because the MFN rate is lower than the bound rate. This is typically referred to as the binding overhang, or “water” in the tariffs. To illustrate this binding overhang and how much applied rates change with the NAMA reform, tables 1a, 1b, and 1c below present averages of (total) bound and applied tariffs before and after the proposed reform, calculated on the basis of the MAcMap database.

Comparisons of bound and applied tariffs before and after a Doha reduction in bound tariffs vary noticeably depending on how averages are calculated -- each tells a different story:

- as trade-weighted averages with applied rates based on bilateral preferential rates (table 1a).
- as trade-weighted averages with applied rates based on MFN, not bilateral rates (table 1b).
- and as simple averages (see table 1c).

The first column in table 1a compares bound rates with applied rates for each country indicating the average binding overhang of the tariff schedules. When the gap between the bound and applied rate is wide, a large cut in the bound rate is needed to produce a given reduction in the applied rate. The second column shows the outcome of the Doha trade round as analysed in this paper.<sup>6</sup> For developing countries, the second column also presents the outcome of an alternative Doha round with no flexibility allowed.

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<sup>6</sup> Recall again that small vulnerable and paragraph 6 economies are able to formulate binding schedules that avoid reductions in applied rates and we do not implement formula cuts for these countries. Similarly, LDCs are exempt from making any reduction commitments.

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**Table 1.a. NAMA trade weighted averages of bound and bilateral applied AVE tariffs, percent.**

	Pre Doha AVE		Post Doha AVE			
	Bound	Applied	Bound	Applied	Bound	Applied
<b>Developed countries</b>						
EU25	3.1	1.7	1.8	1.1		
Norway	2.8	0.1	1.5	0.1		
Switzerland	4.0	0.1	2.4	0.1		
Other EFTA	12.4	2.6	4.2	1.5		
USA	2.6	1.6	1.5	0.9		
Canada	4.8	0.8	2.7	0.5		
Japan	4.2	1.3	1.9	0.8		
Australia	10.4	4.5	3.9	3.0		
New Zealand	11.8	2.2	4.1	2.1		
<b>Developing Countries</b>						
			<b>-- Flexibility --</b>		<b>- No flexibility -</b>	
China	6.0	5.8	4.0	4.0	3.5	3.4
India	35.7	25.9	11.7	10.1	10.7	9.1
Brazil	30.1	10.2	10.9	7.7	9.8	6.9
Other Developing Countries	18.1	3.7	7.7	2.8	7.0	2.5
Small Vulnerable Economies	30.7	7.0				
Paragraph 6 countries	39.5	12.8				
Least Developed Countries	43.4	12.7				

Source: MacMapHS6 database and own calculations

Note: Both pre-Doha and post-Doha figures use pre-simulation trade as weights. Thus, post-Doha averages do not reflect any change in trade patterns as a result of the simulation.

*Applied rates based on bilateral rates.* The average applied tariff covers all bilateral trade flows, including those characterised by Free Trade Agreements and preferential rates, but excluding intra-EU trade. The figures show the average tariff actually applied to the imports coming into the country. The table therefore shows how much applied tariff rates change by implementing the Doha agreement and would give an indication of expected impacts on trade. For example, the average pre-Doha bound rate for New Zealand is 11.8 percent with an average applied rate of just 2.2 percent suggesting a considerable binding overhang. After the trade reform, the average bound rate has been reduced to 4.1 percent resulting in very small a reduction in applied rates to 2.7 percent. Hence, because of the large binding overhang even a 65% reduction in the average bound tariff produces a less than 5% decline in average applied tariffs.

With the notable exception of India, average applied tariffs are already fairly low and trade reform will not result in large tariff reductions. However, India's specific cut in applied tariffs from an average of 26 percent to 10.1 percent (9.1 percent without flexibility) is expected to produce considerable change in relevant trade patterns. Al-

lowing flexibility for developing countries produces smaller cuts in tariffs. On average, the difference in outcome of the two scenarios is not large. However, at the sectoral level the issue of flexibility may very well be significant.

**Table 1.b. NAMA trade weighted averages of bound and MFN AVE tariffs, percent.**

	Pre Doha AVE		Post Doha AVE			
	Bound	MFN	Bound	MFN	Bound	MFN
<b>Developed countries</b>						
EU25	3.1	3.0	1.8	1.7		
Norway	2.8	0.9	1.5	0.5		
Switzerland	4.0	1.9	2.4	1.2		
Other EFTA	12.4	3.1	4.2	2.0		
USA	2.6	2.6	1.5	1.5		
Canada	4.8	2.9	2.7	2.0		
Japan	4.2	1.5	1.9	0.9		
Australia	10.4	4.5	3.9	3.1		
New Zealand	11.8	3.0	4.1	2.7		
<b>Developing Countries</b>			<b>-- Flexibility --</b>		<b>- No flexibility -</b>	
China	6.0	5.8	4.0	4.0	3.5	3.4
India	35.7	26.0	11.7	10.1	10.7	9.1
Brazil	30.1	11.0	10.9	8.3	9.8	7.3
Other Developing Countries	18.1	5.6	7.7	4.1	7.0	3.6
Small Vulnerable Economies	30.7	8.4				
Paragraph 6 countries	39.5	13.0				
Least Developed Countries	43.4	13.2				

Source: MacMapHS6 database and own calculations.

*Applied rates based on MFN rates.* Table 1b presents trade weighted averages with the applied rates based on multilateral MFN rates rather than on bilateral applied rates. In effect, the table ignores Free Trade Agreement and preferential tariff rates. Also, intra-EU trade is excluded. Generally, applied rates in table 1b are not much higher than those in table 1a, suggesting that existing FTAs and preferential rates are on average relatively insignificant. This is mainly due to the fact that average MFN rates are already fairly low. However, these averages may cover large differences from one tariff line to another, and some products may be protected by high import tariffs. In such cases, preferences may have considerable impacts not reflected in these overall statistics.

**Table 1.c. NAMA simple averages of bound and MFN AVE tariffs, percent.**

	Pre Doha AVE		----- Post Doha AVE -----			
	Bound	MFN	Bound	MFN	Bound	MFN
<b>Developed countries</b>						
EU25	4.3	4.1	2.5	2.4		
Norway	3.9	1.9	2.0	0.9		
Switzerland	6.3	4.2	3.5	2.1		
Other EFTA	12.4	3.1	4.2	2.0		
USA	3.5	3.5	2.0	2.0		
Canada	5.8	4.5	2.9	2.5		
Japan	2.8	2.6	1.6	1.5		
Australia	13.1	5.5	4.5	3.3		
New Zealand	13.1	3.3	4.4	2.8		
<b>Developing Countries</b>			<b>-- Flexibility --</b>		<b>- No flexibility -</b>	
China	9.6	9.5	6.2	6.2	5.3	5.3
India	43.7	30.7	13.5	10.9	12.7	10.3
Brazil	31.0	14.6	11.0	9.8	10.0	9.2
Other Developing Countries	25.9	9.8	9.8	6.5	8.8	5.8
Small Vulnerable Economies	39.7	8.6				
Paragraph 6 countries	32.6	12.0				
Least Developed Countries	45.6	13.6				

Source: MacMapHS6 database and own calculations.

*Applied rates based on simple averages.* Table 1c provides applied rates analogous to those in table 1b but calculated as simple, rather than trade weighted, averages. Since these figures are not trade weighted, they are not affected by any trade distortions caused by import barriers and they may be interpreted as the average level of protection provided by import tariffs. In most cases, the simple averages are higher than the trade weighted averages reflecting to some extent the distorting effects of the tariffs.

## AMA scenarios

In this paper we simulate two NAMA scenarios, scenario 1 modelling reductions in applied tariffs allowing for developing country flexibility and scenario 2 modelling an alternative reform without the flexibility. The two scenarios are summarised in Box 1 and described in more detail in the ensuing discussion.

### Box 1. Overview of the NAMA trade reform scenarios

#### NAMA trade reform scenarios

##### Least Developing Countries:

No reduction commitments

##### Paragraph 6 countries:

No tariff reductions through the Swiss formula.

Bind 95 percent of NAMA tariff lines at an average level of max. 28.5 percent

##### Small Vulnerable Economies

No tariff reductions through the Swiss formula.

Bind 95 percent of NAMA tariff lines at an average level of max. 22 percent

##### Newly Acceded Countries

Reduction through the Swiss formula with coefficient 15.

Scenario 1 with 5 percent flexibility and scenario 2 without

Exceptions for Armenia, Moldova and Kyrgyzstan: Commitments similar to Paragraph 6 countries

##### Developing countries

Reduction through the Swiss formula with coefficient 15.

Scenario 1 with 5 percent flexibility and scenario 2 without

##### Developed Countries

Reduction through the Swiss formula with coefficient 10

Duty free access for all least developed countries

The general instrument for specifying tariff reduction commitments is the so-called simple Swiss formula, defined as

$$t_1 = \frac{(a \text{ or } b) \times t_0}{(a \text{ or } b) + t_0}$$

where,

$t_1$ =	Final bound tariff
$t_0$ =	Base rate
$a$ =	Coefficient for developed Members (= 10)
$b$ =	Coefficient for developing Members subject to the formula (= 15)

The base rate is given as the current bound rate or, in the case of unbound tariff lines, the MFN rate plus a constant mark-up of 15 percentage points. The Swiss formula is constructed in such a way that the highest tariffs are reduced the most, thus eliminating tariff peaks. Also, the final bound tariffs will be no higher than the coefficient used in the formula, i.e. 15 percent for developing and 10 percent for developed countries.

The WTO member countries are classified into six groups, each with different binding and tariff reduction commitments (the country classification is given in table 2):

- **Least developed countries or LDCs:** LDCs are exempt from making any commitments.
- **Paragraph 6 countries:** Countries with less than 35 percent binding coverage are exempt from making tariff reductions through the Swiss formula. They are, however, expected to bind 95 percent of non-agricultural tariff lines at an average level that does not exceed the overall average of bound tariffs for all developing countries after full implementation of current concessions. This level is calculated as 28.5 percent.
- **Small vulnerable economies:** These countries are exempt from making tariff reductions through the Swiss formula, although they must bind 95 percent of non-agricultural tariff lines at an average level that does not exceed 22 percent.
- **Newly acceded members:** These countries make the same reduction commitments as developing countries, except for Armenia, Moldova and the Kyrgyz Republic that make the same reductions as paragraph 6 countries.

- **Developing countries:** These implement the Swiss formula with a coefficient value of 15. They do, however, have the flexibility of retaining unbound tariffs or formula cut exemptions for up to 5 percent of all lines, as long as the lines do not exceed 5 percent of the member's total import value.
- **Developed countries:** These countries implement the Swiss formula with a coefficient of 10. Developed countries grant duty-free and quota-free market access for non-agricultural products originating from LDCs.



**Table 2. WTO member countries classification in the NAMA negotiations.**

----- Countries, with no reduction commitments -----			----- Countries with reduction commitments -----		
LDC Paragraph 6 countries	Countries with less than	Small, Vulnerable Economies	Newly acceded Members from year 2000 Demanding exceptions	Developing countries	Developed countries
Angola	Cameroon	Antigua and Barbuda	Albania	Argentina	Australia
Bangladesh	Congo	Barbados	Armenia	Bahrain	Canada
Benin	Cote d'Ivoire	Belize	Croatia	Brazil	Iceland
Burkina Faso	Cuba	Bolivia	F. Yugoslav R. of Macedonia	Bulgaria	Japan
Burundi	Ghana	Botswana	Georgia	Chile	Liechtenstein
Cambodia	Kenya	Brunei Darusalam	Jordan	Colombia	New Zealand
Central African Rep	Macao	Costa Rica	Moldova	Korea	Norway
Chad	Mauritius	Congo Republic	Oman	Hong Kong	Switzerland
Congo	Nigeria	Dominica	Taiwan	India	USA
Dem. Rep. Congo	Sri Lanka	The Dominican Republic	Kyrgyz Republic	Indonesia	EU25
Djibouti	Suriname	Ecuador	China	Israel	
Gambia	Zimbabwe	El Salvador		Kuwait	
Guinea (Conakry)		Fiji		Malaysia	
Guinea Bissau		Gabon		Mexico	
Haiti		Grenada		Morocco	
Lesotho		Guatemala		Pakistan	
Madagascar		Guyana		Peru	
Malawi		Honduras		Philippines	
Maldives		Jamaica		Qatar	
Mali		Mongolia		Rumania	
Mauritania		Namibia		Singapore	
Mozambique		Nicaragua		South Africa	
Myanmar		Panama		Egypt	
Nepal		Papua New Guinea		Thailand	
Niger		Paraguay		Tunisia	
Rwanda		Saint Kitts and Nevis		Turkey	
Senegal		Saint Lucia		United Arab Emirates	
Sierra Leone		Saint Vincent Grenadines		Venezuela	
Solomon Isles		Swaziland			
Tanzania		Trinidad and Tobago			
Togo		Uruguay			
Uganda					
Zambia					

### *Implementing the scenarios*

To implement the NAMA trade reform for our trade policy analysis, we use tariff data for the year 2001, obtained from the MAcMap database. This is the same data used in the GTAP database and our tariff calculations are therefore directly compatible with standard GTAP tariff data.<sup>7</sup> The product coverage follows the chairman's proposal for an agreed list of Non-Agricultural products in the HS6 (2002 revision) nomenclature (WTO 2006b).

For bound, MFN and applied tariffs, the MAcMap database reports *ad valorem* tariffs and *ad valorem* equivalents of specific tariffs. *Ad valorem* tariffs specify a duty as a percentage of the trade flow's value. A specific tariff is expressed as a fixed amount per unit of import that has been converted into a value percentage using a unit value (the calculation of the *ad valorem* equivalents was done by CEPII when compiling the MacMap database). The total *ad valorem* equivalent (AVE) tariff applied to a given trade flow is thus the corresponding *ad valorem* and AVE specific tariff added together.

In order to analyse the economic consequences of the NAMA trade reform, we need to calculate how the reform changes applied tariffs. First, we apply the Swiss formula to pre-Doha bound *ad valorem* and AVE specific tariffs separately. The resulting post-Doha bound tariffs are compared to pre-Doha applied tariffs. Any applied *ad valorem* or specific tariff, which is higher than the corresponding post-Doha bound tariff, is reduced to this new bound level. In effect, we lower the tariff ceiling and cut off of all applied rates hitting the ceiling. Finally, we add applied *ad valorem* and AVE specific tariffs to obtain a total post-Doha AVE applied tariff.

This general procedure is subject to a range of exceptions for certain countries as described above. We elaborate upon these exceptions in the following.

### *No reduction commitments*

Recalling that Least Developed Countries are exempt from making any commitments, we make no changes to their applied tariffs. Also, as paragraph 6 and small vulnerable economies must only bind 95 percent of their tariff lines at an average rate not exceeding 28.5 percent and 22 percent, respectively, we find that these nations are able

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<sup>7</sup> In order to avoid a "mis-marriage" of data with our calculated shocks to the data base, we have first aggregated the MAcMAP database up to GTAP concordance without making any changes to the tariffs. We have then incorporated these tariffs into the initial GTAP data base before we began our update and NAMA reduction scenarios.

to formulate binding schedules that avoid reductions in applied rates. This is documented in table 3 showing the simple average of all MFN tariff lines for paragraph 6 countries and small vulnerable economies. All averages are below 28.5 percent and 22 percent respectively, implying that the proposed commitments of these countries are already satisfied, even with 100 percent binding coverage. We consequently assume that these two groups of countries formulate binding tariff schedules in such a way that no reductions in applied tariffs are needed (simply choosing to bind tariffs at the MFN level should accomplish this).<sup>8</sup>

**Table 3. The simple average of all NAMA MFN AVE tariffs, percent.**

Paragraph 6 countries				Small Vulnerable Economies			
	Average AVE tariff	Range of MFN AVE tariffs			Average AVE tariff	Range of MFN AVE tariffs	
		Lowest	Highest			Lowest	Highest
Armenia	2.2	0.0	10.0	Antigua and Barbuda	9.4	0.0	70.0
Cameroon	16.9	0.0	30.0	Barbados	8.9	0.0	70.0
Cuba	11.0	0.0	30.0	Belize	9.4	0.0	50.0
Côte d'Ivoire	11.4	0.0	20.0	Bolivia	9.1	0.0	10.0
Ghana	13.1	0.0	89.2	Botswana	9.3	0.0	45.6
Kenya	18.8	0.0	40.0	Brunei Darussalam	4.4	0.0	1980.6
Kyrgyzstan	7.1	0.0	50.0	Costa Rica	5.1	0.0	37.6
Mauritius	22.7	0.0	82.5	Dominica	8.7	0.0	165.0
Moldova	3.3	0.0	15.0	Dominican Republic	8.0	0.0	20.0
Nigeria	26.3	2.5	100.0	Ecuador	11.6	0.0	20.0
Sri Lanka	8.3	0.0	25.0	El Salvador	6.6	0.0	30.0
Suriname	9.9	0.0	40.0	Gabon	12.1	0.0	30.0
Zimbabwe	18.5	0.0	309.3	Grenada	9.8	0.0	40.0
				Guatemala	6.4	0.0	25.0
				Guyana	9.5	0.0	60.0
				Honduras	5.1	0.0	15.0
				Jamaica	6.0	0.0	40.0
				Namibia	8.7	0.0	45.6
				Nicaragua	3.8	0.0	15.0
				Panama	6.6	0.0	36.3
				Papua New Guinea	5.0	0.0	96.1
				Paraguay	12.8	0.0	25.0
				Saint Kitts and Nevis	9.8	0.0	70.0
				Saint Lucia	8.0	0.0	70.0
				Saint Vincent	9.0	0.0	40.0
				Swaziland	8.7	0.0	45.6
				Trinidad and Tobago	8.3	0.0	40.0
				Uruguay	13.7	0.0	23.0

Source: MacMapHS6 database and own calculations.

Note. The simple average of MFN AVE tariff is calculated by first adding the *ad valorem* tariff and AVE of the specific tariff together for each tariff line and then calculating the simple average of all tariff lines at the HS6 digit level.

<sup>8</sup> Since our trade simulations use applied rates rather than bound or MFN rates directly, we do not need to estimate expected post-Doha bound rates for these countries.

Note that the fairly low simple averages in some cases cover wide spreads, with some tariffs reaching levels in the hundreds and in one case (Brunei) even thousands of percent.

*Developing country flexibility rule*

Developing countries are allowed to exempt up to 5 percent of national tariff lines from tariff reductions, provided the trade value of those tariff lines does not exceed 5 percent of total NAMA imports. We implement this flexibility rule assuming that tariff lines with the highest applied rates are the most sensitive and therefore the ones chosen for exemption. In cases where multiple tariff lines share the same applied rate level, we assume that tariff lines with the highest import value are excluded. However, this simple rule of implementation entails a choice between slightly underestimating or slightly overestimating the degree of flexibility enjoyed by some developing countries. This is because for each country a single tariff line is binding; implying that all tariff lines with higher applied rates (and trade values in case of ties) obeys the two 5 percent criteria and is therefore exempted from reduction commitments. The question is whether to include or exclude the single binding tariff line, although in most cases it makes little difference. However, for some countries the binding tariff line represents a sizable share of imports, implying that one overestimates developing country flexibility if the binding tariff line is exempted and underestimates the flexibility if it is not. In the present analyses, we have chosen to exempt the binding tariff line whereby we overestimate developing country flexibility slightly.

Table 4 provides each DC's binding restriction, and data suggests that a few countries, notably India and Chile, exempt a larger share of imports than allowed by the agreement.

**Table 4. Implementation of flexibility for developing countries: Binding criteria emboldened**

Country	----- Percent of -----		Country	----- Percent of -----	
	Tariff lines	Import value		Tariff lines	Import value
Albania	0.1	5.2	Macedonia	4.1	5.0
Argentina	2.8	5.1	Malaysia	5.0	3.3
Armenia	2.3	5.0	Mexico	5.0	2.4
Bahrain	0.1	5.4	Moldova. Rep.of	5.0	2.7
Brazil	5.0	4.6	Morocco	5.0	4.9
Bulgaria	4.3	5.1	Oman	5.0	0.5
Chile	0.0	11.4	Pakistan	0.9	5.0
China	5.0	2.3	Peru	5.0	2.4
Colombia	1.6	5.0	Philippines	5.0	4.5
Croatia	5.0	4.9	Qatar	0.4	6.1
Egypt	5.0	3.9	Romania	2.5	5.3
Georgia	2.6	5.0	Singapore	0.0	8.2
Hong Kong	0.0	5.2	South Africa	5.0	1.3
India	0.4	13.4	Taiwan	5.0	2.8
Indonesia	2.7	5.4	Thailand	4.5	5.0
Israel	5.0	2.0	Tunisia	5.0	4.9
Jordan	5.0	1.0	Turkey	5.0	1.9
Korea	5.0	2.1	United Arab Emirates	0.0	8.1
Kuwait	0.0	8.8	Venezuela	0.0	5.4
Kyrgyzstan	2.0	6.5			

Source: MacMapHS6 database and own calculations.

#### *The significance of developing country flexibility*

The only difference between the two scenarios presented in this paper is the 5 percent flexibility rule. Assuming that the countries apply this flexibility to the most sensitive (presumably the most protected) products, this concession is potentially very trade-distorting. However, the consequences of this distortion are not equally distributed among trading nations. To illustrate this point, table 5 shows the share of total NAMA exports going to developing countries and the share of total NAMA exports affected by the flexibility rule for a number of selected countries (the full list of nations is given in table A1 in the appendix A).

**Table 5. NAMA exports affected by developing country flexibility, percent**

	Share of NAMA exports to developing countries	Share of NAMA exports facing flexibility
Denmark	9.2	0.1
Germany	14.1	0.4
Spain	14.3	0.4
Australia	44.9	1.8
USA	38.3	0.5
China	33.9	1.0
India	32.4	1.1
Argentina	58.7	7.7
Uruguay	60.4	10.5
Malawi	52.2	39.2
Swaziland	73.5	19.3
Kenya	15.7	2.4

Source: MacMapHS6 database and own calculations.

Although the countries in table 5 are not randomly selected, the figures do illustrate the general pattern: A relatively small share of most countries' exports faces tariffs exempted from reduction commitments. However, the few countries that are severely hit by the flexibility rule, notably Malawi, Swaziland, Uruguay and Argentina, are all developing or least developed countries. In fact, only three of the 10 countries mostly affected by flexibility are developed countries.

#### *Calculating shocks to the GTAP model/database*

The resulting NAMA scenario's shocks to the GTAP model/database are calculated at the HS6 digit tariff line level for the 149 WTO members listed in table 2. The changed applied tariffs, due to the Swiss formula's reduction of bound tariffs, are then aggregated to GTAP commodity and regional concordance using trade weights (three year average of COMTRADE trade values) in order to be able to implement these new AVE applied tariffs in the GTAP database/model.

#### *Updating the initial GTAP tariff structure*

The GTAP database version 6 uses 2001 as the base year. A number of important developments have taken place since then or are planned for the immediate future preceding implementation of a Doha round. In order not to attribute the effect of such developments to the Doha round scenarios analysed in this paper, we update the standard GTAP tariff structure before simulating the scenarios.<sup>9</sup> We have identified five of the most important developments as follows:

<sup>9</sup> Every update is implemented at the HS6 digit level before aggregation to GTAP concordance.

**1. Final implementation of Uruguay Round commitments**

For a number of countries, some applied tariffs still exceed the bound tariffs in the 2001 tariff data due to the fact that the Uruguay round has not yet been fully implemented. We reduce applied tariffs affecting trade flows between WTO countries to their bound levels.

**2. China's accession to the WTO**

The 2001 MacMap data base contains a bound tariff schedule for China even if this has not yet been implemented. We update the applied tariff schedule by reducing, to their bound levels, China's applied tariffs on trade from WTO members as well as other WTO members' tariffs faced by China.

**3. Abolishment of export quotas on textiles and wearing apparel shipped to the EU and the USA.**

**4. EU enlargement from 15 to 25 members**

We update the applied, MFN and bound tariffs of the 10 new EU members to give them the same tariff schedules as the rest of the EU. In a similar manner, we adjust non-EU tariffs faced by the new members. Finally, we eliminate all internal tariffs between the new and existing EU members.

**5. Implementation of EU's Everything But Arms (EBA) initiative**

EU's EBA initiative has been approved, but not yet implemented. We incorporate the concessions anyway to avoid crediting the Doha round with effects of tariff reductions, which will take place whether or not negotiations are concluded successfully. The EBA is implemented by eliminating all EU tariffs faced by Least Developed Countries.

Thus we begin by conducting a "pre-simulation" that involves implementing those pre-existing WTO commitments and FTAs not implemented as of 2001. We then take the resulting data set from that pre-simulation as the base for our NAMA analysis.<sup>10</sup>

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<sup>10</sup> Evaluating the effects of the NAMA reduction commitments in the updated 2001 database is a conservative estimate of the economic effect of an agreement. The actual implementation of an agreement would take place some time in the future where the world economy and trade volumes have increased, thereby also increasing the effects of implementing a NAMA agreement as measured by the equivalent variation in income.

## Results

### *Global effects of reducing NAMA AVE tariffs with and without flexibility.*

The main conclusion from the trade analyses is that the overall economic impact of NAMA tariff reductions is rather modest. Global welfare, measured as the EV in income, increases by 9.3 billion US\$ in the main scenario with developing country flexibility (see table 6)<sup>11</sup>. Most of the gains are concentrated in a few economic sectors, mainly textiles and wearing apparel, but also chemical, rubber and plastics, motor vehicles and parts and machinery and other equipment. Asian countries are the main winners, while Africa is virtually unaffected as most of the continent is exempt from making any reductions under the NAMA reform. The alternative scenario, analysing the NAMA reform without developing country flexibility, produces a global welfare gain of 11.8 billion US\$, about 26 percent higher than a NAMA reform with developing country flexibility.

Table 6 shows that the NAMA reductions increase global trade by 1.0 percent with, and by 1.1 percent without flexibility. Manufacturing trade increases by 1.3 percent with the flexibility rule and by 1.5 percent without. These increases in trade and global welfare reflect further reductions in trade barriers that increase efficiency of endowments employed in the global economy.

Five sectors stand out in table 6: textiles, wearing apparel, chemical/rubber/plastic products (CRP), machinery and equipment not elsewhere classified (M-NEC), and motor vehicles and parts (MVP). The reductions in the AVE tariffs for these five sectors collectively account for 63-64 percent of the NAMA-induced welfare gains, regardless of whether or not the flexibility rule is implemented.

Of the 9.3 billion US\$ of NAMA-induced welfare gains with flexibility, about 30 percent is collectively attributed to increased trade in textiles and wearing apparel, while CRP and M-NEC sectors each account for about 11 percent. The MVP sector accounts for over 10 percent of such global gains.

Table 6's NAMA-induced effects without flexibility have the five stand-out sectors of focus take on similar *relative* patterns of contributions as under the scenario with flexibility (excepting motor vehicles and parts discussed below), although flexibility's

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<sup>11</sup> For a brief description of the equivalent variation of income concept and the process of comparative static equilibrium in the GTAP model/database, see appendix B.



elimination does influence (generally raises) trade volumes of these sectors. The motor vehicles and parts or MVP sector is particularly notable in that exclusion of flexibility does change the sector's standing relative to the other four sectors, as well as the volume of sector trade. In the NAMA scenario without flexibility, the MVP sector contributes most towards global gains: over 2.0 billion US\$ or over 17 percent of the 11.8 billion US\$ worth of NAMA-induced welfare gains. As well, MVP volume of world trade rises from NAMA reductions without flexibility by 1.5 percent, up substantially from 0.7 percent under the scenario with flexibility. Compared with the setting with flexibility, table 6 shows that eliminating flexibility while implementing NAMA reductions increases trade by 0.3 percentage points to 5.9 percent for textiles; and by 0.5 percentage points to 7.3 percent for wearing apparel. The volume of world trade of the machinery and equipment sector is hardly influenced by exclusion of flexibility.

**Table 6. Contributions from reducing AVE tariffs to the Global EV in income and percentage change in quantity of trade, by commodity.**

	% change in volume of trade <sup>a</sup>		With Flexibility index	Contributions to the Global EV in income			Difference in value Mill. US\$
	With Flex.	No Flex		With Flexibility Mill. US\$	No Flexibility Mill US\$		
Food	0.3	0.4	1.9	179	228	50	
Natural Resources	0.3	0.4	2.3	213	506	293	
Manufacturing							
Textiles	5.6	5.9	15.5	1447	1544	98	
Wearing apparel	6.8	7.3	14.4	1345	1563	218	
Leather products	4.2	4.6	6.3	584	680	96	
Wood products	0.4	0.4	1.3	118	122	4	
Paper products, publishing	0.6	0.6	1.2	110	114	4	
Petroleum, coal products	0.4	0.4	0.3	26	26	0	
Chemical, rubber, plastic prod.	1.2	1.5	11.2	1050	1380	331	
Mineral products n.e.c.	1.7	1.8	3.2	301	325	25	
Ferrous metals	1.0	1.0	3.0	276	292	16	
Metals n.e.c.	1.3	1.3	3.4	319	321	2	
Metal products	1.6	1.7	2.9	271	278	7	
Motor vehicles' and parts	0.7	1.5	10.5	977	2038	1061	
Transport equipment n.e.c.	0.5	0.6	1.6	149	218	69	
Electronic equipment	0.0	0.1	3.3	306	340	35	
Machinery & equipment n.e.c.	1.1	1.1	11.3	1051	1071	20	
Manufactures n.e.c.	2.5	2.8	6.6	617	739	122	
Total Manufactures	1.3	1.5	95.8	8947	11053	2107	
Services	0.3	0.3	0.0	0	0	0	
Total world	1.0	1.1	100.0	9338	11787	2450	

<sup>a</sup> The percentage change in volume of global trade includes intra EU trade.

Table 7 provides economic impacts of the two NAMA scenarios for 45 countries. Welfare gains are not evenly distributed across countries, with a varied mix of country gainers and losers. Of the 9.3 billion US\$ of NAMA-induced welfare gains with flexibility: Developed WTO member countries account for 1.3 billion US\$ or 14 percent, the EU25 accounts for 1.4 billion US\$, and Japan benefits by 1.9 billion US\$. There are important WTO member losers: the United States loses 2.2 billion US\$, while Canada's welfare drops 0.1 billion US\$.

Asian countries excluding Japan realize 6.8 billion US\$ or 73 percent of the 9.3 billion US\$ of NAMA-induced global welfare gains. These gains partially arise from increased trade in textiles, wearing apparel, and leather goods that collectively account for 3.8 billion US\$ or over half of the 6.8 billion US\$ regional Asian gain.

Latin America collectively increases welfare by 1.3 billion US\$ that is 14 percent of the NAMA-induced global gains under flexibility. Africa, however, realizes less than 3 percent of the global NAMA gains, and for two reasons. First, only four developing African countries (Morocco, Egypt, South Africa, and Tunisia) are participating in the NAMA program with reductions. And second, numerous less-developed African countries already enjoy pre-NAMA duty-free access to the EU market (e.g., everything but arms) and have exports burdened by preference erosion in EU markets.

Table A2 in the appendix A decomposes welfare effects into allocative efficiency and terms of trade changes. The NAMA reductions improve efficiency in almost all regions/countries listed in table 6 with the exception of four regions, EFTA, Russian Federation and Middle East, Rest of Former Soviet Union, and Uganda. As increasing (decreasing) efficiency translates into higher (lower) domestic production levels, this is also reflected in a real GDP growth (decline).

A number of countries/regions lose from the NAMA reform, namely the USA, Canada, Portugal, Poland, Rest of EU, Rest of Europe, the Russian Federation and the Middle East and Rest of Former Soviet Union.

The Russian Federation, as a WTO non-member, loses market shares in WTO export markets to other WTO member countries, which are gaining relatively better market access. The same is true for the aggregate region Middle East and Rest of Former Soviet Union, where some of the aggregated countries are not members of the WTO.

In the United States and Canada, net welfare declines arise from negative terms of trade effects having outweighed positive gains from increased efficiency. For example, a US efficiency gain of 1 billion US\$ is more than countered by a -3.2 billion US\$ effect from a fall in the terms of trade. Under these reductions, the fall in the US terms of trade is explained by US export prices having declined as non-NAFTA countries gain increased NAMA-induced access to North American markets.

There are similar instances of net NAMA-induced welfare declines from negative terms of trade effects having dominated positive efficiency gains in Portugal, Poland, and the Rest of the EU. These countries/regions have the NAMA reductions erode preferential market access to internal EU/EFTA countries, and these areas export over 80 percent of their manufacturing goods to the internal EU/EFTA markets.

Looking at the effect on manufacturing production and trade, the analysis shows that the volume of manufacturing production will remain unchanged at the global level but the volumes of world manufacturing trade will increase by some 1.3 percent.

Notably India will increase its trade with the rest of the world exporting 19.6 percent more while importing 27.9 percent more. Also China, Thailand, Brazil Malawi and Madagascar are other notable regions that increase their exports well above the world average of 1.3 percent.

**Table 7. Impacts of the NAMA Reform, by region.**

	No flexibility		With developing country flexibility			
	Change in		Real GDP	---Volume of manufacturing <sup>a</sup> ---		
	--- Total Welfare --- Mill US\$	Change in Mill US\$		Production % change	exports % change	import % change
Australia	373	160	0.1	-0.3	2.7	1.9
New Zealand	33	34	0.0	0.0	0.8	0.5
Rest of Oceania	12	12	0.0	0.1	0.9	0.4
Total Oceania	417	206	-	-0.2	2.3	1.6
China <sup>b</sup>	2358	1929	0.1	-0.1	3.7	5.8
Japan	1907	1899	0.0	0.2	1.6	2.3
Korea <sup>b</sup>	1532	1419	0.1	0.1	1.5	2.3
Taiwan <sup>b</sup>	836	679	0.1	0.3	1.3	1.5
Indonesia <sup>b</sup>	352	192	0.0	0.7	1.5	1.1
Malaysia <sup>b</sup>	574	295	0.1	0.7	1.3	1.6
Thailand <sup>b</sup>	1228	436	0.2	1.0	3.1	3.8
India <sup>b</sup>	891	682	0.4	-1.1	19.6	27.9
Rest of Asia <sup>b</sup>	1219	1174	0.0	0.7	1.5	0.5
Total Asia	10897	8704	-	0.1	2.6	3.4
Canada	-191	-137	0.0	-0.2	0.2	0.4
USA	-2427	-2199	0.0	0.0	1.7	1.0
Mexico <sup>b</sup>	635	581	0.2	-0.2	1.5	1.7
Brazil <sup>b</sup>	468	368	0.1	-0.7	4.1	5.2
Rest of America <sup>b</sup>	381	339	0.0	-0.4	2.1	1.9
Total America	-1134	-1047	-	-0.1	1.5	1.2
Belgium/Luxembourg	138	116	0.0	0.4	0.6	0.6
Denmark	27	30	0.0	-0.2	0.0	0.1
Germany	436	277	0.0	0.0	0.4	0.5
Greece	67	20	0.0	-0.1	0.9	0.4
Spain	304	242	0.0	0.1	0.9	0.5
France	217	209	0.0	0.0	0.4	0.3
Ireland	28	38	0.0	-0.1	0.0	-0.1
Italy	365	295	0.0	0.0	0.7	0.7
Netherlands	43	29	0.0	-0.2	-0.1	0.1
Austria	22	30	0.0	-0.1	-0.1	0.0
Portugal	-83	-87	0.0	-0.1	-0.1	-0.3
Finland	35	49	0.0	0.0	0.3	0.4
Sweden	116	129	0.0	-0.1	0.1	0.3
United Kingdom	169	181	0.0	0.0	0.7	0.5
Poland	-17	-47	0.0	-0.1	0.0	0.0
Rest of EU	-67	-82	0.0	-0.2	-0.2	-0.1
European Union	1799	1431	-	0.0	0.4	0.4
EFTA	85	130	-0.0	-0.1	-0.1	0.1
Rest of Europe <sup>b</sup>	-13	-49	0.1	-0.3	0.1	0.5
Russian Federation	-241	-167	-0.0	-0.2	-0.7	-0.5
M. East and Rest of F. Soviet Union <sup>b</sup>	-261	-123	-0.0	-0.3	-0.5	0.0

**Table 7. Continued**

	No flexibility		With developing country flexibility			
	Change in	Change in	---Volume of manufacturing <sup>a</sup> ---			
	--- Total Welfare ---	Real GDP	Production	exports	import	
	Mill US\$	Mill US\$	% change	% change	% change	% change
Malawi	4	3	0.0	0.5	12.6	0.6
Mozambique	2	2	0.0	-0.6	-0.6	0.1
Tanzania	4	3	0.0	-0.2	0.2	0.3
Zambia	2	2	0.0	-0.2	-0.2	0.2
Zimbabwe	5	5	0.0	-0.4	-1.4	0.2
Madagascar	23	23	0.0	4.3	16.6	5.2
Uganda	1	1	-0.0	-1.0	-3.4	0.1
Rest of Africa <sup>b</sup>	196	214	0.1	-0.8	3.4	3.3
Total Africa	238	252	-	-0.8	3.3	3.2
Total world	11787	9338	-	0.0	1.3	1.3

<sup>a</sup> The result for the manufacturing sectors shown in the table are an aggregation of the 16 manufacturing sectors found in the GTAP data base.

<sup>b</sup> Developing countries and aggregated regions where developing countries are included which implement the flexibility rule.

#### *NAMA-induced effects on welfare without flexibility*

Without the implementation of the flexibility rule, global welfare gains are 26 percent (2.5 billion US\$) larger than with the rule: 11.8 billion US\$ vs. 9.3 billion US\$. The developing Asian countries (excluding Japan) account for roughly 90 percent (2.2 billion US\$) of this difference. This larger welfare gain is mainly achieved through a further reduction in these countries' trade-distorting AVE tariffs having increased their efficiency gains. The largest efficiency gains arise from further reductions in trade-distorting AVE tariffs in the motor vehicles and parts sector where the average (trade weighted) AVE tariff rate in this region is reduced from 17.4 to 8.3 percent when the flexibility rule is not implemented (table 8).

Not all countries/regions gain from the flexibility rule's elimination. Thirteen of the countries/regions listed in table 7 actually lose slightly in terms of EV in income. This arises from adverse terms of trade effects due to the further reduction in trade distorting AVE tariffs by the developing countries. Some countries win while others lose, with the final effect on a particular country dependent on whether the country is a net importer or exporter of the products affected by the removal of the flexibility rule.

**Table 8. Change in Asian EV in income and Average AVE import tariffs (excluding Japan)**

	EV in income mill. US\$			Pre Doha	Average AVE import tariff %		
	W. flex	N flex	Difference		Post W. flex	Post N flex	Difference
Food	130	161	31	18.7	18.5	18.4	-0.1
Natural resources	130	347	217	4.7	3.9	3.6	-0.3
Textiles	821	819	-2	9.1	6.6	6.5	-0.2
Wearing apparel	2342	2488	146	8.7	5.9	5.2	-0.7
Leather products	660	707	47	3.1	2.4	2.2	-0.1
Wood products	39	37	-2	4.4	3.2	3.1	-0.1
Paper prod., publishing	30	32	2	4.6	3.4	3.4	-0.0
Petroleum, coal, prod.	42	42	0	7.2	6.4	6.4	-0.0
Chemical, rubber, plastic	328	1006	678	7.5	5.3	4.8	-0.5
Mineral products n.e.c.	131	131	0	9.2	6.3	6.0	-0.4
Ferrous metals	127	132	5	5.9	4.2	4.0	-0.3
Metals n.e.c.	201	201	0	6.3	3.6	3.5	-0.1
Metal products	167	175	9	8.6	5.9	5.6	-0.3
Motor vehicles' & parts	271	1066	795	19.7	17.4	8.3	-9.1
Transport equip. n.e.c.	139	290	150	4.5	3.9	3.6	-0.3
Electronic equipment	287	316	28	0.9	0.7	0.6	-0.1
Machinery & equip. n.e.c.	654	690	37	5.4	3.6	3.6	-0.0
Manufactures n.e.c.	306	349	43	11.8	6.0	5.3	-0.7
Total manufacturing	6545	8481	1936	5.4	3.9	3.4	-0.5
Services	0	0	0	0.0	0.0	0.0	0.0
Total	6805	8989	2184	-	-	-	-

### *Effects on Denmark*

This section summarizes the simulated effects of the NAMA scenarios - with and without developing country flexibility - on the Danish economy. We focus on changes in Danish exports, imports, domestic production, and finally on overall economic welfare.

### *Effects of NAMA reductions on Danish exports.*

The overall story of the consequences for Danish exports is one of erosion of preferential access to EU internal markets combined with greater market access in WTO members outside the EU. As a member of the EU customs union, Denmark enjoys duty-free access to all EU member countries. As the external trade barriers are coming down with the reduction in EU tariffs, non-member countries gain easier access to EU markets, thus sharpening the competition faced by Danish companies. At the same time, the global tariff reductions increase the access of Danish products to non-EU markets. As the internal market is by far the most important trade partner for Danish goods, the preference erosion effect is larger than the market access effect and the net change in manufacturing exports is slightly negative (-45 million US\$). However,

as the expansion in world trade boosts Danish exports of transport services (by 99 million US\$)<sup>12</sup>, the effect on total Danish exports, including agriculture, natural resources, manufacturing and services, is positive (53 million US\$).

Tables 9a and 9b provide effects on Danish exports of NAMA-induced reductions with and without flexibility. Denmark's 0.1 percent rise in total exports under the NAMA reductions with the flexibility rule falls well below the global increase of 1.0 percent. With total manufacturing exports falling by 45 million US\$, Danish exports of services increase by 104 million US\$ (0.4 percent), primarily due to a 99 million US\$ increase in exports of international transportation services. On net, Danish total export value increases 53 million US\$ under this scenario.

Figure 9a shows that under NAMA reductions with flexibility, Danish trade composition changes, shifting exports from the EU/EFTA (declining 1.0 percent) towards the Rest of the World (ROW) (rising 2.1 percent). This change in Danish export composition is nicely exemplified by considering machinery and equipment n.e.c. (M-NEC) exports under the NAMA reductions (with flexibility). Results show:

- Denmark's global M-NEC exports increase by 0.6 percent or 59 million US\$. This is a net effect of a 2.5 percent or 101 million US\$ increase in new Danish exports to ROW markets (as average ROW tariffs fall from 4.4 to 3.4 percent), and a 0.6 percent or 41 million US\$ decline in sales to EU/EFTA markets.
- The NAMA reductions erode Denmark's preferential access to the internal EU market, by increasing the market access of other WTO members. This accounts for table 9a's declines in Danish M-NEC exports to EU/EFTA markets.

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<sup>12</sup> Please note that the 99 million US\$ of expanded exports of transport services do not appear explicitly in table 9a. They are included under services in the world total column (104 million US\$), but do not register in the exports of services to the EU/EFTA and Rest of the World sub-totals. The reason is that unlike other types of services, international transport services are not exported to any particular region in the model. Therefore, it is not possible to decompose exports of total transport services into exports bound for EU/EFTA or the Rest of the World.

**Table 9a. Changes in Danish exports, with flexibility**

EXPORTS to	Total World		----- EU plus EFTA -----				----- Rest of the world -----			
	change quantity	% Change Mill. US\$	AVE pre	tariff post	Mill. US\$	% change quantity	AVE pre	tariff post	Mill. US\$	% change quantity
Food	0.0	-6	1.2	1.2	-18	-0.2	25.1	25.0	12	0.5
Natural resources	0.1	-1	0.0	0.0	3	0.3	0.7	0.7	-4	-1.9
Textiles	-1.2	-20	0.0	0.0	-36	-3.6	10.0	7.5	16	10.8
Wearing apparel	-5.0	-42	0.0	0.0	-50	-6.9	12.4	9.6	8	11.4
Leather products	-4.2	-10	0.0	0.0	-11	-5.2	11.7	8.7	0	0.6
Wood products	0.4	5	0.0	0.0	0	0.1	3.7	3.2	6	1.6
Paper prod., publishing	-0.1	-1	0.0	0.0	-1	-0.1	6.5	5.9	1	0.4
Petroleum, coal, prod.	0.4	1	0.0	0.0	0	0.1	4.0	3.4	1	1.8
Chemical, rubber, plastic	-0.3	-24	0.0	0.0	-36	-0.7	3.3	2.6	12	0.6
Mineral products n.e.c.	-0.4	-3	0.0	0.0	-4	-0.8	5.5	4.2	1	0.4
Ferrous metals	0.4	2	0.0	0.0	-1	-0.1	10.2	8.3	3	3.7
Metals n.e.c.	0.7	3	0.0	0.0	-4	-1.1	9.2	6.1	7	14.4
Metal products	0.6	6	0.0	0.0	-5	-0.5	7.0	5.6	11	4.4
Motor vehicles <sup>a</sup> & parts	-2.0	-18	0.0	0.0	-14	-1.9	9.2	8.6	-4	-2.2
Transport equip. n.e.c.	1.3	7	0.0	0.0	-6	-1.6	5.1	4.4	13	5.0
Electronic equipment	-0.2	-8	0.0	0.0	-16	-0.7	3.9	3.5	8	1.6
Machinery & equip. n.e.c.	0.6	59	0.0	0.0	-41	-0.6	4.4	3.4	101	2.5
Manufactures n.e.c.	-0.3	-2	0.0	0.0	-3	-0.7	4.9	4.1	1	0.7
Total manufacturing	-0.0	-45	0.0	0.0	-228	-1.0	4.6	3.7	183	2.1
Services <sup>a</sup>	0.4	104	0.0	0.0	-4	0.0	0.0	0.0	9	0.1
Total	0.1	53	-	-	-246	-0.5	-	-	200	0.9

<sup>a</sup> Services in the world total column (104 million US\$) include international transport services, which do not register in the exports of services to the EU/EFTA and Rest of the World sub-totals. The reason is that unlike other types of services, international transport services are not exported to any particular region in the model. Therefore, it is not possible to decompose exports of total transport services into exports bound for EU/EFTA or the Rest of the World.

Table 9a shows that the NAMA reductions (with flexibility) elicit declines in Danish exports to EU and EFTA markets for most of the 16 manufacturing sectors, and a collective decline in manufacturing exports of 228 million US\$. Danish declines occur from an erosion of Denmark's preferential access relative to Non-members: that is, Non-member exports to EU/EFTA markets rise and crowd-out or divert Denmark's sales.

On the other hand, the NAMA reductions bring increased market access to WTO member markets outside of the EU and EFTA, augmenting other Danish manufacturing exports bound for the ROW. As average ROW tariffs on such Danish exports decline from 4.6 percent to 3.7 percent, Danish exports to the ROW rise for all manufacturing sub-sectors except one, motor vehicles and parts (table 9a).



Danish exports of motor vehicles and parts or MVP are of particular note, with Danish exports globally falling 2 percent or 18 million US\$, reflecting declines in Danish exports to both EU/EFTA and ROW markets in table 9a. Interestingly, Danish exports to the ROW fall, despite the NAMA-induced drop in average ROW tariffs on such sales from 9.2 to 8.6 percent. NAMA apparently reduces the average ROW tariff on MVP exports of Denmark's competitors from lower pre-NAMA average tariff levels and by more. For example (and not documented in table 9a), ROW average tariffs on German and Japanese motor vehicle and parts exports are reduced by 1.4 and 1.1 points from 7.9 percent and 7.3 percent respectively. So Danish exports of motor vehicles and parts are consequently displaced by relatively cheaper imports from other countries.

Table 9b shows that implementing NAMA reductions without flexibility manages to generate a similar rise in Danish export quantity of 0.1 percent or 50 million US\$, roughly the same as in the flexibility scenario. However, this similarity covers a larger increase in the Danish export of services (reflecting a greater expansion in global trade) combined with a larger drop in manufacturing exports. Danish manufacturing exports to the world fall 0.1 percent or 72 million US\$, which is the net effect of a 236 million US\$ decline in Danish manufacturing sales to EU and EFTA markets and a partially offsetting rise in sales to Non-member ROW countries of 163 million US\$ as the average ROW tariffs on trade falls a point from 4.6 to 3.6 percent.

The significance of developing country flexibility for Danish exports is exemplified by the MVP sector. Exports to the EU and EFTA are not directly affected by flexibility. It falls by roughly the same amount in both scenarios (14 million US\$) as Danish preferential access to these markets erodes. However, the decline in MVP export to the rest of the world is almost trebled, from 4 million US\$ to 11 million US\$, if developing country flexibility is removed. It may seem surprising that the better market access to developing country markets caused by removal of the flexibility rule reduces Denmark's export opportunities. The explanation is that Denmark's main competitors in those markets, notably Germany and Japan, gain even better market access and Danish exporters become more squeezed by the sharpened competition.

**Table 9b. Changes in Danish exports, without flexibility.**

EXPORTS to	Total World		EU plus EFTA				Rest of the world			
	% change quantity	Mill. US\$	% AVE pre	% tariff post	Change Mill. US\$	% change quantity	% AVE pre	% tariff post	Change Mill. US\$	% change quantity
Food	0.1	5	1.2	1.2	-12.8	-0.1	25.1	24.9	17.4	0.6
Natural resources	0.0	-3	0.0	0.0	0.3	0.2	0.7	0.6	-2.9	-1.3
Textiles	-1.2	21	0.0	0.0	-36	-3.5	10.0	7.4	15	10.3
Wearing apparel	-5.1	-43	0.0	0.0	-49	-6.9	12.4	9.3	7	10.3
Leather products	-4.1	-10	0.0	0.0	-11	-5.2	11.7	8.5	0	0.8
Wood products	0.4	6	0.0	0.0	0	0.1	3.7	3.1	6	1.6
Paper prod. publishing	0.7	6	0.0	0.0	-2	-0.2	6.5	5.2	7	5.0
Petroleum, coal, prod.	0.3	1	0.0	0.0	0	0.1	4.0	3.4	1	1.5
Chemical, rubber, plastic	-0.4	-35	0.0	0.0	-39	-0.8	3.3	2.6	4	0.2
Mineral products n.e.c.	-0.4	-3	0.0	0.0	-4	-0.8	5.5	4.1	1	0.3
Ferrous metals	0.4	2	0.0	0.0	-1	-0.1	10.2	8.3	3	3.5
Metals n.e.c.	0.7	3	0.0	0.0	-4	-1.2	9.2	6.0	7	15.3
Metal products	0.6	7	0.0	0.0	-5	-0.5	7.0	5.5	12	4.7
Motor vehicles' & parts	-2.7	-25	0.0	0.0	-14	-2.0	9.2	8.4	-11	-5.7
Transport equip. n.e.c.	1.0	5	0.0	0.0	-6	-1.8	5.1	4.4	12	4.5
Electronic equipment	-0.4	-13	0.0	0.0	19	-0.8	3.9	3.5	6	1.3
Machinery & equip. n.e.c.	.5	2	0.0	0.0	-42	-0.6	4.4	3.4	94	2.3
Manufactures n.e.c.	-0.5	-4	0.0	0.0	-4	-0.7	4.9	4.1	0	0.0
Total manufacturing	-0.1	-72	0.0	0.0	-236	-1.0	4.6	3.6	163	1.9
Services <sup>a</sup>	0.5	121	0.0	0.0	-2.7	0.0	0.0	0.0	10.2	0.1
Total	0.1	50			-251	-0.5			188	0.9

<sup>a</sup> The total change in the value of trade with services includes international transportation service which is not exported to any specific region in the world.

#### *Effects of NAMA reductions on Danish imports.*

The effects of the NAMA reform on Danish imports mirror the changes in exports. The sources of Danish manufacturing imports shift from trade partners in the EU and EFTA to the rest of the world, as the preferential access to Danish markets enjoyed by EU and EFTA members is eroded by reductions in external tariffs. The net increase in total Danish imports is smaller than the expansion of Danish exports, producing a (small) positive impact on the trade balance.

Tables 10a and 10b provide effects on Danish imports from NAMA reductions with and without flexibility. Table 10a illustrates that the reduction in AVE tariffs on Danish imports from the NAMA reform (with flexibility) reduces Danish imports from EU/EFTA markets and increases imports from ROW markets. This changing trend in Danish import composition is exemplified by Danish wearing apparel imports: imports from EU/EFTA markets fall 90 million US\$; imports from ROW markets rise

133 million US\$ as Danish import tariffs on such sales decline from 9.8 to 4.8 percent; and on net, Danish imports increase 2.6 percent or 43 million US\$ globally. Overall, total Danish global imports rise by 34 million US\$ or 0.1 percent from average tariff reductions when NAMA reductions are implemented with flexibility. This net effect arises from a 407 million US\$ increase in imports from ROW markets having exceeded a 373 million US\$ decline in imports from EU/EFTA markets.

**Table 10a. Changes in Danish imports, with flexibility**

IMPORTS from	Total World		EU plus EFTA				Rest of the world			
	% Change	Mill.	%	Change	%	Change	%	Change	%	Change
	change	US\$	AVE	tariff	Mill.	change	AVE	tariff	Mill.	change
	quantity		pre	post	US\$	quantity	pre	post	US\$	quantity
Food	0.3	14	0.4	0.3	-29	-0.8	7.8	7.1	43	2.8
Natural resources	0.4	3	1.0	0.7	6	0.7	0.6	0.5	-2	-0.6
Textiles	-1.3	-19	0.0	0.0	-82	-13.5	7.7	4.0	63	9.1
Wearing apparel	2.6	43	0.0	0.0	-90	-19.0	9.8	4.8	133	10.8
Leather products	0.3	1	0.0	0.0	-22	-6.1	6.9	4.2	23	12.5
Wood products	-0.1	-2	0.0	0.0	-1	0.0	0.8	0.7	-1	-0.3
Paper prod., publishing	-0.1	-1	0.0	0.0	-1	-0.1	0.0	0.0	0	-0.5
Petroleum, coal, prod.	0.0	-1	0.0	0.0	-1	0.0	0.4	0.4	0	0.6
Chemical, rubber, plastic	-0.1	-9	0.0	0.0	-33	-0.6	2.5	1.7	23	4.7
Mineral products n.e.c.	0.1	1	0.0	0.0	-5	-0.5	3.1	2.2	6	4.6
Ferrous metals	0.0	0	0.0	0.0	-2	-0.1	0.8	0.7	1	1.1
Metals n.e.c.	0.1	0	0.0	0.0	-1	-0.1	3.2	2.4	1	6.6
Metal products	0.2	2	0.0	0.0	-5	-0.3	2.2	1.6	6	3.4
Motor vehicles' & parts	0.4	6	0.0	0.0	-44	-2.3	8.0	4.0	50	19.1
Transport equip. n.e.c.	0.0	-1	0.0	0.0	-16	-1.2	1.3	1.0	15	1.6
Electronic equipment	0.1	1	0.0	0.0	-17	-0.4	1.2	0.8	18	2.2
Machinery & equip. n.e.c.	0.1	0	0.0	0.0	-23	-0.3	1.2	0.9	23	2.0
Manufactures n.e.c.	0.1	1	0.0	0.0	-3	-0.5	1.8	1.3	4	1.1
Total manufacturing	0.1	22	0.0	0.0	-346	-1.2	3.9	2.2	368	5.2
Services	0.0	-5	0.0	0.0	-4	0.0	0.0	0.0	-1.5	0.0
Total	0.1	34	-	-	-373	-0.9	-	-	407	2.2

Table 10b provides effects on Danish imports from NAMA reductions without flexibility. Qualitatively, similar trends in effects occur as with the prior simulation with flexibility. Table 10b shows that without flexibility: Denmark's imports from traditional EU/EFTA markets fall 396 million US\$, as imports from ROW markets rise 416 million US\$, so as to generate a net gain in global imports of 20 million US\$ or 0.1 percent.

**Table 10b. Changes in Danish imports, without flexibility**

IMPORTS from	Total World		----- EU plus EFTA -----				----- Rest of the world -----			
	% Change	Mill.	%	Change	%	%	% Change	Mill.	%	%
	change	US\$	AVE	tariff	Mill.	change	AVE	tariff	Mill.	change
	quantity		pre	post	US\$	quantity	pre	post	US\$	quantity
Food	0.3	15	0.4	0.3	-28	-0.8	7.8	7.1	43	2.8
Natural resources	0.4	3	1.0	0.7	5	0.6	0.6	0.5	-2	-0.4
Textiles	-1.4	-19	0.0	0.0	-82	-13.6	7.7	4.0	63	9.1
Wearing apparel	2.6	43	0.0	0.0	-90	-19.0	9.8	4.8	133	10.8
Leather products	0.3	1	0.0	0.0	-22	-5.9	6.9	4.2	23	12.1
Wood products	-0.1	-2	0.0	0.0	0	0.0	0.8	0.7	-1	-0.4
Paper prod., publishing	0.0	-1	0.0	0.0	0	0.0	0.0	0.0	0	-0.5
Petroleum, coal, prod.	0.0	-1	0.0	0.0	-1	-0.1	0.4	0.4	0	1.1
Chemical, rubber, plastic	-0.1	-12	0.0	0.0	-36	-0.7	2.5	1.7	24	4.9
Mineral products n.e.c.	0.1	1	0.0	0.0	-5	-0.5	3.1	2.2	6	4.7
Ferrous metals	0.0	-1	0.0	0.0	-3	-0.2	0.8	0.7	1	1.2
Metals n.e.c.	0.1	0	0.0	0.0	-1	-0.1	3.2	2.4	1	6.6
Metal products	0.1	1	0.0	0.0	-5	-0.4	2.2	1.6	6	3.5
Motor vehicles' & parts	0.4	5	0.0	0.0	-49	-2.6	8.0	4.0	54	21.1
Transport equip. n.e.c.	0.0	-2	0.0	0.0	-18	-1.4	1.3	1.0	16	1.8
Electronic equipment	0.0	-1	0.0	0.0	-21	-0.5	1.2	0.8	20	2.5
Machinery & equip. n.e.c.	0.0	-4	0.0	0.0	-28	-0.4	1.2	0.9	24	2.1
Manufactures n.e.c.	0.0	0	0.0	0.0	-4	-0.5	1.8	1.3	4	1.1
Total manufacturing	0.1	9	0.0	0.0	-367	-1.3	3.9	2.2	376	5.3
Services	0.0	-7	0.0	0.0	-6	0.0	0.0	0.0	-1	0.0
Total	0.1	20	-	-	-396	-0.9	-	-	416	2.3

Abolishing the flexibility rule fails to substantially influence Danish imports: flexibility's elimination has total Danish imports decline 14 million US\$ from 34 million US\$ in table 10a to 20 million US\$ in table 10b. This reduction arises from a decline in Danish manufacturing exports that in turn reduces production, and ultimately dampens import demand for intermediate commodities.

*Effects of NAMA-induced Tariff reductions on Danish domestic production.*

Table 11 provides the percentage changes in Danish production for total manufacturing and selected subsectors from NAMA-induced reductions in world AVE tariffs.

**Tabel 11. Change in quantity Danish production, percent.**

	Of which contributions from Reductions in					
	% change		AVE tariffs faced by Danish exports	Danish AVE tariffs on imports	EU24 EFTA Import AVE Tariffs	All other AVE tariffs In the world
	Quantity of production					
	<i>No flex</i>	<i>With flex.</i>				
Food	-0.03	-0.10	-0.38	-0.07	0.00	0.35
Natural Resources	-0.08	-0.05	-0.09	-0.01	0.04	0.02
Textiles	-2.26	-2.22	1.80	3.57	-6.17	-1.42
Wearing apparel	-5.90	-5.86	0.95	1.32	-7.02	-1.10
Leather products	-3.55	-3.62	2.32	0.38	-3.53	-2.79
Wood products	0.33	0.31	-0.02	0.25	-0.05	0.12
Paper products, publishing	0.08	-0.02	-0.15	-0.03	0.00	0.16
Petroleum, coal products	0.15	0.18	0.13	0.01	0.00	-0.04
Chemical, rubber, plastic prod.	-0.37	-0.26	0.44	0.14	-0.20	-0.66
Mineral products n.e.c.	-0.15	-0.15	0.18	-0.09	-0.05	-0.19
Ferrous metals	0.26	0.32	0.83	-0.05	-0.06	-0.39
Metals n.e.c.	0.53	0.54	2.00	-0.01	-0.39	-1.06
Metal products	0.04	0.05	0.35	-0.07	-0.02	-0.20
Motor vehicles' and parts	-1.62	-1.27	-0.06	-0.36	-0.65	-0.20
Transport equipment n.e.c.	0.92	1.20	1.41	0.28	-0.11	-0.38
Electronic equipment	-0.35	-0.22	-0.36	-0.02	0.03	0.14
Machinery & equipment n.e.c.	0.32	0.38	1.33	0.00	0.24	-1.19
Manufactures n.e.c.	-0.23	-0.18	0.03	-0.04	0.00	-0.17
Total manufacturing products	-0.22	-0.17	0.52	0.11	-0.29	-0.51
Services	0.04	0.03	-0.08	-0.01	0.04	0.09

Table 11 shows that NAMA reductions with flexibility decreases total Danish manufacturing production by 0.17 percent. The decomposition analysis shows that:

- Reduced world tariffs levied on Danish exports markets outside the EU/EFTA region increases manufacturing production by 0.52 percent.
- Reduced Danish import tariffs augment manufacturing production by 0.11 percent as cheaper intermediate inputs reduce costs and stimulate production.
- The increased market access by Non-member countries to the internal market of the EU24 plus EFTA reduces Danish production by 0.29 percent (trade diversion).
- Not only do the Danish exporters of manufactures gain increased market access, so do other WTO member countries. This increased competition on all

other markets (excluding the EU and EFTA present in the previous column) reduces Danish production of manufactures by 0.51 percent.

- These cumulated effects ( $0.52 + 0.11 + -0.29 + -0.51$ ) imply a 0.17 percent drop in Danish manufacturing production.

Examining effects on table 11's individual GTAP sectors illuminates other notable sector-specific effects on Danish production from NAMA-induced tariff reductions. Consider, for example the electronic equipment sector where production declines by 0.22 percent. It may seem counter-intuitive that a reduction in AVE tariffs faced by Danish exports to non EU/EFTA countries actually reduces Danish electronic equipment production by 0.36 percent. This is because the 0.36 percent reduction in production arises from enhanced competition between all industries in the Danish economy on the domestic labour and capital markets (allocation of endowments). While the reduction of the AVE tariff rate faced by the electronic equipment sector is reduced by 0.4 percentage points, other industries/sectors are experiencing larger reductions in AVE tariffs rates on their export markets, so as to pull endowments out of the electronic equipment sector, and registering a production decline for the sector.

This inter-sector competition on the domestic endowments also explains the decomposition of the small increase in services production (0.03 percent). The service sector in this NAMA analysis faces no change to its trade barriers. The decomposition demonstrates an opposite situation faced by the Danish services sector as faced above for total manufacturing: fall in manufacturing production releases endowments for use in the services sector and visa versa.

The reduction in Danish import tariff rates can of course have a negative effect on production if it is substituting domestically produced goods in private consumption.

There can also be indirect effects from changes in production and trade patterns of other countries, with ultimate effects on Danish production. This could be the case where a foreign industry using Danish intermediate products experiences a declining/expanding production due to the changing AVE tariffs.

In aggregate, the no-flexibility scenario produces a slightly larger decline in manufacturing production compared with the with-flexibility scenario (-0.22 versus -0.17 percent). Especially the MVP sector, along with the transport equipment sector, are negatively affected by removing the flexibility concession. In the first case, the decline in

production is higher (-1.62 versus -1.27 percent), and in the latter production grows by less (0.92 versus 1.20). Sectors positively affected by removal of flexibility include leather products, wood products and the paper products and publishing sectors.

#### *Welfare impact on Denmark*

The economic impact on at the macro level is minimal for Denmark, gaining 30 million US\$ per year as measured by the EV in income.

This gain stems from a slight increased allocative efficiency in the Danish economy due to the reallocation of endowments between industries resulting in an increase in the quantity of real GDP by 0.019 percent and an increase in factor income of 0.004 percent in the Danish economy even though the terms of trade is slightly negative for Denmark.

The improvement in allocative efficiency is a result of reallocation of endowments (capital and labour) from sectors characterised by higher levels of economic distortions (such as tariff protection, production subsidies, etc.) to less distorted sectors. Endowment reallocations can be deduced from table 11 by looking at changes in production. Endowments flow from sectors with declining production to expanding sectors.

The removal of the developing nation flexibility rule virtually has no impact on Danish welfare, which falls by a negligible 3 million US\$. This is not surprising as only about 0.1 percent of Danish manufacturing exports are affected by the flexibility rule (see table A1 in the appendix).

The smaller welfare gain compared to the scenario with flexibility is caused by a smaller improvement in the Danish economy's allocative efficiency, as the outflow of endowments from the agricultural sector is reduced (in table 11, the food sector declines by only 0.03 without flexibility as opposed to 0.10 percent with flexibility). This smaller endowment outflow is in turn the result of the slightly larger decline in the manufacturing sector (-0.22 percent without flexibility as opposed to -0.17 with flexibility) releasing more endowments for alternative use in the agricultural and services sector.

## Qualifications and Concluding Comments

We find that on average the NAMA reform produces relatively small reductions in tariffs. Least developed countries are exempt from making any reductions, and we find that many developing countries (the so-called paragraph 6 and small vulnerable economies) can implement their NAMA commitments in such a way that reductions in applied tariffs are altogether avoided. As for all other countries, with the notable exception of India, non-agricultural tariffs are on average already fairly low (single digits).

The reduction of NAMA tariffs is found to modestly increase global trade by about 1 percent and global welfare by just over 9 billion US\$ when the developing countries use the flexibility rule to exempt up to 5 percent of their tariff lines. And while trade expands for most observed sectors, there is variation in such increases across sectors, with particularly high gains realised for the textile and wearing apparel sectors. A number of Asian countries particularly benefit from the NAMA reductions. The abolishment of the flexibility rule is found to increase global welfare by 26 percent to nearly 12 billion US\$ with Asian countries clearly gaining most from increasing market access.

The NAMA tariff reductions with flexibility are expected to generate modest increases in Danish trade: 53 million US\$ in exports; 34 million US\$ in imports; producing a slight improvement in the trade balance of 19 million US\$. The reductions are expected to increase Danish welfare by 30 million US\$. Of interest is that the NAMA reductions are expected to shift Danish trade patterns from EU and EFTA markets towards other world markets. Readers should note, however, that despite the net gains to Denmark from the NAMA reductions, some winner and loser industries are expected to emerge. Danish transport services are likely to benefit while Danish exports of motor vehicles and parts may show slight reductions. The removal of the developing country flexibility rule has virtually no impact on Danish welfare.

In this paper we focused on illuminating the economic impacts of a possible WTO NAMA tariff reductions scenario, with and without the developing country flexibility rule. We note that this study focuses only on the economic impacts of the NAMA tariff reductions, and does not include liberalisation of agricultural and services sector barriers implied/proposed by WTO round efforts. Secondly, the model used in this analysis is a comparative static one and does not include dynamic gains from increased trade in the analysis.



## References

- Bouet, Antoine, Yvan Decrex, Lionel Fontagne, Sebastien Jean and David Laborde (2005). *A consistent, ad-valorem equivalent measure of applied protection across the world: The MAcMap-HS6 database*. CEPII No 2004 – 22 December (updated September 2005)
- Dimaranan, Betina V., Editor (2005). *Global Trade, Assistance, and Production: The GTAP 6 Data Base*, Center for Global Trade Analysis, Purdue University. [https://www.gtap.agecon.purdue.edu/databases/v6/v6\\_doco.asp](https://www.gtap.agecon.purdue.edu/databases/v6/v6_doco.asp)
- Hertel, Thomas. (1997). *Global Trade Analysis: Modelling and applications*. Cambridge University Press 1997. <http://www.cepii.fr/anglaisgraph/workpap/pdf/2004/wp04-22.pdf>
- WTO (2004). Doha Work Program – Decision Adopted by the general Council on 1 August 2004. WT/L/579
- WTO (2006a). Towards NAMA Modalities. The negotiating Group on Market Access, 22 June 2006. JOB(06)/200/Rev. 1
- WTO (2006b). Chairman's proposal on product coverage of non-agricultural products in the HS2002 nomenclature. The negotiating Group on Market Access, 8 May 2006. JOB(06)/126/Rev. 1

## Appendix A

**Table A1. NAMA export affected by flexibility (full list), percent**

Less developed countries					
	Share of export to Developing Countries	Share of ex- ports faced by flexibility		Share of export to Developing Countries	Share of exports faced by flexibility
Angola	24.1	0.0	Madagascar	3.6	0.2
Bangladesh	6.3	0.2	Malawi	52.2	39.2
Benin	6.3	0.1	Maldives	10.0	0.3
Burkina Faso	12.2	0.3	Mali	36.8	0.0
Burundi	19.6	0.0	Mauritania	4.2	0.3
Cambodia	9.7	0.5	Mozambique	12.9	0.5
Central African republic	3.2	0.0	Myanmar	45.2	0.5
Chad	4.3	0.0	Nepal	38.4	0.1
Congo	52.0	0.0	Niger	31.7	0.0
Congo (democratic rep.)	1.1	0.0	Rwanda	69.3	0.1
Djibouti	4.7	0.0	Senegal	23.5	0.3
Equatorial guinea	26.3	0.0	Sierra Leone	3.7	0.0
Gambia	11.9	0.6	Solomon islands	63.4	0.0
Guinea	10.7	0.0	Tanzania	11.0	0.5
Guinea-Bissau	32.9	0.0	Togo	21.2	0.0
Haiti	0.3	0.0	Uganda	27.2	0.7
Lesotho	0.3	0.1	Zambia	21.9	1.1
Paragraph 6 Countries					
Cameroon	18.7	0.0	Mauritius	5.8	0.3
Cuba	12.7	0.2	Nigeria	23.5	0.0
Côte D'ivoire	7.8	0.0	Sri Lanka	9.7	0.6
Ghana	8.8	0.0	Suriname	3.0	0.0
Kenya	15.7	2.4	Zimbabwe	25.5	0.6
Macau	11.9	0.4			
Small, Vulnerable Economies					
Antigua and Barbuda	6.2	0.0	Guyana	4.2	0.0
Barbados	3.4	0.0	Honduras	0.7	0.1
Belize	10.0	0.1	Jamaica	3.9	0.0
Bolivia	40.5	0.4	Mongolia	49.9	0.7
Botswana	4.5	0.3	Namibia	24.6	0.1
Brunei Darussalam	37.0	0.0	Nicaragua	3.0	0.3
Costa Rica	13.7	0.1	Panama	29.6	0.7
Dominica	11.1	0.1	Papua new guinea	26.4	0.0
Dominican Republic	1.3	0.1	Paraguay	76.5	0.1
Ecuador	33.4	2.6	Saint Kitts and Nevis	1.0	0.0
El Salvador	2.0	0.2	Saint Lucia	8.0	0.1
Fiji	4.8	0.1	Saint Vincent	4.4	0.0
Gabon	19.2	0.0	Swaziland	73.5	19.3
Grenada	0.8	0.0	Trinidad and Tobago	10.9	0.0
Guatemala	4.2	0.1	Uruguay	60.4	10.5
Newly acceded members from year 2000					
Albania	3.1	0.0	Kyrgyzstan	27.0	0.5
Armenia	19.4	0.1	Macedonia	7.9	0.2
China	33.9	1.0	Moldova, Rep.of	10.5	0.2
Croatia	4.3	0.1	Oman	66.3	0.2
Georgia	36.3	0.1	Taiwan	46.7	0.3
Jordan	41.2	1.8		27.0	0.5

**Table A1. Continued**

Developing Countries					
	Share of export to Developing Countries	Share of ex- ports faced by flexibility		Share of export to Developing Countries	Share of ex- ports faced by flexibility
Argentina	58.7	7.7	Mexico	3.4	0.1
Bahrain	42.6	0.6	Morocco	13.8	0.1
Brazil	32.4	1.5	Pakistan	25.5	0.2
Bulgaria	18.7	0.5	Peru	29.1	0.2
Chile	37.0	0.4	Philippines	36.8	0.7
Colombia	23.9	0.7	Qatar	42.3	0.1
Egypt	16.5	0.2	Romania	15.6	1.0
Hong Kong	44.1	1.3	Singapore	53.8	0.7
India	32.4	1.1	South Africa	22.1	0.4
Indonesia	39.1	0.9	Thailand	37.1	1.5
Israel	22.0	0.1	Tunisia	5.2	0.1
Korea	42.4	1.1	Turkey	14.2	1.1
Kuwait	36.6	0.1	United Arab Emirates	37.5	0.1
Malaysia	45.6	0.6	Venezuela	12.8	0.2
Developed					
Australia	44.9	1.8	Italy	18.5	0.7
Austria	10.3	0.2	Japan	45.6	1.6
Belgium	14.8	0.2	Latvia	4.2	0.0
Canada	5.4	0.0	Lithuania	4.8	0.1
Cyprus	14.9	0.3	Luxembourg	7.0	0.1
Czech republic	5.8	0.3	Malta	30.5	0.0
Denmark	9.2	0.1	Netherland Antilles	39.5	0.1
Estonia	3.8	0.0	Netherlands	9.6	0.1
Falkland islands	0.8	0.0	New Zealand	25.8	0.5
Faroe islands	0.2	0.0	Norway	5.4	0.1
Finland	16.0	0.0	Poland	5.3	0.2
France	14.5	0.3	Portugal	5.4	0.2
French Polynesia	24.4	0.0	Slovakia	4.3	0.4
Germany	14.1	0.4	Slovenia	12.7	0.6
Gibraltar	8.5	0.1	Spain	14.3	0.4
Greece	29.7	2.3	Sweden	13.3	0.2
Greenland	6.3	0.1	Switzerland	20.7	0.2
Hungary	7.6	0.2	United Kingdom	14.0	0.2
Iceland	3.5	0.9	United States of America	38.3	0.5
Ireland	8.1	0.1	Virgin Islands (British)	11.7	0.2

Source: MacMapHS6 database and own calculations.

Note: Only WTO members are included in the list

**Table A2. Welfare effects of NAMA. Equivalent Variation in income decomposition (Million 2001 US\$)**

	----- With Flexibility -----			----- No Flexibility -----		
	Change In total Welfare	----- of which ----- Efficiency Gains	Terms of trade	Change In total Welfare	----- of which ----- Efficiency Gains	Terms of trade
Australia	160	245	-85	373	248	125
New Zealand	34	6	28	33	5	27
Rest of Oceania	12	3	9	12	3	9
Total Oceania	206	254	-48	417	256	161
China	1929	935	993	2358	1530	828
Japan	1899	581	1317	1907	538	1368
Korea	1419	409	1010	1532	522	1010
Taiwan	679	161	518	836	487	350
Indonesia	192	29	164	352	89	264
Malaysia	295	80	215	574	310	264
Thailand	436	216	219	1228	488	740
India	682	1896	-1214	891	2144	-1252
Rest of Asia	1174	53	1121	1219	104	1116
Total Asia	8704	4361	4343	10897	6210	4687
Canada	-137	137	-273	-191	129	-320
USA	-2199	965	-3164	-2427	945	-3372
Mexico	581	1021	-440	635	1238	-603
Brazil	368	463	-95	468	607	-139
Rest of America	339	325	14	381	410	-29
Total America	-1047	2912	-3958	-1134	3329	-4463
Belgium/Luxembourg	116	85	31	138	87	51
Denmark	30	30	-1	27	29	-2
Germany	277	283	-5	436	294	142
Greece	20	35	-16	67	41	26
Spain	242	85	157	304	94	210
France	209	212	-3	217	222	-5
Ireland	38	20	19	28	18	10
Italy	295	169	126	365	187	177
Netherlands	29	68	-38	43	73	-30
Austria	30	32	-2	22	32	-9
Portugal	-87	2	-89	-83	3	-87
Finland	49	26	23	35	23	12
Sweden	129	44	85	116	45	72
United Kingdom	181	210	-29	169	211	-42
Poland	-47	11	-58	-17	14	-31
Rest of EU	-82	32	-114	-67	31	-98
European Union	1431	1345	86	1799	1403	396
EFTA	130	-3	133	85	-11	96
Rest of Europe	-49	50	-99	-13	90	-103
Russian Federation	-167	-83	-84	-241	-106	-135
M. East and Rest of Former Soviet Union	-123	-64	-59	-261	-46	-215
Malawi	3	1	2	4	1	3
Mozambique	2	0	2	2	0	2
Tanzania	3	1	2	4	1	3
Zambia	2	0	1	2	0	2
Zimbabwe	5	0	5	5	0	4
Madagascar	23	1	22	23	1	22
Uganda	1	0	1	1	0	1
Rest of Africa	214	593	-379	196	692	-496
Total Africa	252	596	-344	238	695	-458
Total world	9338	9368	-31	11787	11821	-34

## Appendix B

### *The equivalent variation of income concept.*

In this paper, we first provide a brief overview of the GTAP equilibrium displacement process from a NAMA-induced change in AVE tariffs, and then provide a broad overview of the NAMA scenarios' effects on global welfare. For both, we use the equivalent variation (EV) in income not only to measure changes in global welfare, but to identify scenario-induced patterns of gains and losses for individual countries or regions. The EV in income measures annual change in a country's income (gains or losses) from having implemented the NAMA scenarios. The EV is simply defined as the difference between the initial pre-NAMA income and the post-scenario income after implementation of NAMA reductions, with all prices set as fixed at current (pre-NAMA) levels.

$$\text{EV} = \text{Post NAMA Income} - \text{pre NAMA Income}$$

The EV is thereby a doubly effective measure for discerning global economic impacts of NAMA reform. First, the EV provides a monetary valuation of effects induced by NAMA policy changes globally and at the country or regional level, so as to illuminate winners and losers. And second, the EV also facilitates comparisons of different policy scenarios, given that income changes are measured in initial base prices.

There are two main channels through which the EV in income would be affected by reducing trade distortions in different countries around the world. The first is the efficiency gain achieved when a country's own trade distortions are removed or when it interacts favourably with trade shocks abroad. More specifically, the efficiency gains are achieved through reallocating resources of production (land, labour, capital) to their most efficient use in the global economy. This more efficient reallocation of resources in the economy is driven by the reduction of border protection in each country increasing trade and thereby international competition on the domestic market resulting in a restructuring of industries and the endowments employed by them.<sup>13</sup> Typically the efficiency effect stemming from global trade liberalization is positive for participating countries.

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<sup>13</sup> As the model used in this analysis is a simple comparative static model there are no adjustment costs involved in moving the economy from one equilibrium to another. All capital is malleable and the wage rate and capital/land rents adjust so that there is no change in the total amount of endowments used in the global economy.

The second channel is through a change in a country's international terms of trade. For example, a net exporter of a heavily protected manufacturing commodity would expect an increase in its terms of trade when an importing country reduces its border restrictions (AVE tariffs) (unless they are currently enjoying duty-free access to protected markets where domestic prices fall). The importing country would increase its volume of imports causing the price of imports to increase. But, one region's terms of trade gain is another's terms of trade loss as net importing countries experience higher prices due to the increased demand for the manufactured good from the exporting country (unless they become sufficient net exports in the course of adjusting to the new conditions). Therefore, the terms of trade effect stemming from global trade liberalization is difficult to generalise because (i) if one country is winning another is losing and (ii) there are numerous preferential market access arrangements in force around the world.

*Process of comparative static equilibrium in the GTAP model.*

Initially, the economy is in a pre-shock equilibrium where expenditure equals income, and where demand equals supply for each modelled region and globally. By imposing a shock on this equilibrium, say with a NAMA-induced change in AVE tariffs, import prices change, expenditure and income are no longer equal, and demand and supply are dis-equilibrated. Changes in relative prices induce domestic consumers to immediately substitute away from the relatively more costly imports, and towards imports that are now cheaper. The cheaper imports elicit a decline in the composite price of intermediate inputs, which in turn generates excess profits at current prices, after which output expansion along with associated demand increases for primary factors of production ultimately follow. Now in a state of disequilibrium due to the AVE tariff changes, the GTAP general equilibrium model then moves the global economy towards a post-shock equilibrium, where demand again equals supply and expenditure again equals income for each country/region and globally under the new regime of post-NAMA tariffs. The model reports the percentage change in production, exports, imports consumption, relative prices, etc. that will bring each country/region in the global economy back into equilibrium once more. The economy will remain in this equilibrium until some other input (for example a change in technology) or a policy change shocks the economy out of its new equilibrium state.

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